PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

543155

Applicant's or agent's file reference PA-04010/PCT	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/JP2004/000623	International filing date *(day/month/year)* 23.01.2004	Priority date *(day/month/year)* 23.01.2003
International Patent Classification (IPC) or national classification and IPC Int.Cl.[7] F28F1/30		
Applicant SHOWA DENKO K.K.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☑ a total of 11 sheets, as follows:
      ☑ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
   - ☑ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☑ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22.11.2004	10.08.2005
Name and mailing address of the IPEA/JP **Japan Patent Office**	Authorized officer 3L 8610

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/000623

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☑ the description:

pages 1-28 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☑ the claims:

Nos. 2,4,5,7-9,19,21,29,31,33,35,37,39,40 as originally filed/furnished

Nos. 1,3,6,11,12,15-18,20,23,24, 27,28,30,32,34,36,,38,41-43 as amended (together with any statement) under Article 19

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☑ the drawings:

pages 1/8-8/8 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☑ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☑ the claims, Nos. 10,13,14,22,25,26

☐ the drawings , sheets/figs _____

☐ the sequence listing (specify): _____

☐ any table(s) related to sequence listing (specify): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (specify): _____

☐ any table(s) related to sequence listing (specify): _____

** If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/000623

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-9,11,12,15-21,23,24,27-43	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-9,11,12,15-21,23,24,27-43	NO
Industrial applicability (IA)	Claims	1-9,11,12,15-21,23,24,27-43	YES
	Claims		NO

2. Citations and explanations(Rule 70.7)

1) The following documents have been considered for the purpose of this report:

D1: JP 2001-241874 A (SHOWA DENKO K.K.)2001.09.07
D2: JP 7-218174 A (MITSUBISHI ALUMINUM CO., LTD.)1995.08.18
D3: JP 62-272099 A (NIHON PARKERIZING CO., LTD.)1987.11.26
D4: JP 2000-97589 A (SHOWA ALUMINUM CORPORATION)2000.04.04
D5: JP 7-198283 A (SHOWA ALUMINUM CORPORATION)1995.08.01

2) The subject matter of claim 1-9, 11, 12, 15-21, 23, 24, 27-43 does not appear to involve an inventive step in view of the documents D1-D2.

D1 discloses a heat exchanger equipped with a heat transfer fin, comprising a plurality of heat transfer plates disposed between a pair of heat exchanging tubes arranged in parallel at a certain distance, the heat transfer plates being provided with a plurality of louvers at certain intervals along the air passage.

D2 discloses a heat transfer fin, wherein the cross-sectional contour configuration of the windward and the leeward side edge of the heat transfer plate is formed into a triangular configuration with an acute-angled tip.

The skilled person in the art would easily conceive the idea of applying the above facts in D2 to the invention disclosed in D1.

D3 discloses a heat exchanger comprising skived fins.

D4 discloses a heat exchanger, which has a heat transfer fin disposed in a heat exchanging tube.

D5 discloses a heat transfer medium, wherein a cross- sectional contour configuration of the heat transfer medium inlet side edge of the heat transfer plate is formed into a curved configuration.

The skilled person in the art would easily conceive the idea of applying the above facts in D2-D5 to the invention disclosed in D1.

PCT/JP04/00625

10 AUG 2004

CLAIMS

1. (Amended) A heat transfer fin, comprising:

a heat transfer plate for transferring heat of a heat transfer medium via the heat transfer plate, the heat transfer plate being disposed parallel or nearly parallel to a flowing direction of the heat transfer medium,

wherein a heat transfer medium inlet side edge of the heat transfer plate is formed so as to become thinner toward an upstream side of a heat transfer medium flowing direction, and

wherein a cross-sectional contour configuration of the heat transfer medium inlet side edge of the heat transfer plate is formed into a curved configuration.

2. The heat transfer fin as recited in claim 1, wherein a heat transfer medium outlet side edge of the heat transfer plate is formed so as to become thinner toward a downstream side of the heat transfer medium flowing direction.

3. (Amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed in parallel with each other at certain intervals to form an air passage between adjacent heat transfer plates, whereby heat of air passing through the air passage is transferred via the heat transfer plates,

wherein a windward side edge of the heat transfer plate is formed so as to become thinner toward a windward side of the air, and

PCT/JP04/00025
10 AUG 2004

wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate is formed into a curved configuration.

4. The heat transfer fin as recited in claim 3, wherein the plurality of heat transfer fins are disposed independently as plate fins.

5. The heat transfer fin as recited in claim 3, wherein the plurality of heat transfer fins are connected such that adjacent heat transfer fins are connected to form a corrugated fin.

6. (Amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed between a pair of heat exchanging tubes arranged in parallel at a certain distance, the plurality of heat exchanging plates being disposed in parallel with each other at certain intervals along a longitudinal direction of the heat exchanging tube to form an air passage between adjacent heat exchanging tubes, whereby air passing through the air passage exchanges heat with refrigerant passing through the heat exchanging tubes,

wherein a windward side edge of the heat transfer plate is formed so as to become thinner toward a windward side of the air, and

wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate is formed into a curved configuration.

PCT/JP04/00825

10 AUG 2004

7. The heat transfer fin as recited in claim 6, wherein the plurality of heat transfer plates are disposed independently as plate fins.

8. The heat transfer fin as recited in claim 6, wherein the plurality of heat transfer plates are connected such that adjacent heat transfer fins are connected to form a corrugated fin.

9. The heat transfer fin as recited in claim 6, wherein the plurality of heat transfer plates are integral skived fins formed by skiving a surface of the heat exchanging tube.

10. (deleted)

11. (amended) The heat transfer fin as recited in any one of claims 3 to 9, wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate is formed into a semielliptic configuration.

12. (amended) The heat transfer fin as recited in any one of claims 3 to 9, wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate is formed into a semicircular configuration.

13. (deleted)

14. (deleted)

15. (amended) The heat transfer fin as recited in any one of claims 3 to 9, 11 or 12, wherein a leeward side edge of the heat transfer plate is formed so as to become thinner toward a leeward side of the air.

16. (amended) A heat transfer fin, comprising:

a heat transfer plate disposed parallel or nearly parallel to a heat transfer medium passing direction, the heat transfer plate being provided with a plurality of louvers at certain intervals along the heat transfer medium passing direction to transfer heat of the heat transfer medium via the heat transfer plate,

wherein a heat transfer medium inlet side edge of the louver is formed so as to become thinner toward an upstream side of the heat transfer medium passing direction, and

wherein a cross-sectional contour configuration of the heat transfer medium inlet side edge of the louver is formed into a curved configuration.

17. (amended) The heat transfer fin as recited in claim 16, wherein a heat transfer medium outlet side edge of the louver is formed so as to become thinner toward a downstream side of the heat transfer medium passing direction.

18. (amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed in parallel with each other at certain intervals to form an air passage between adjacent heat transfer plates, the heat transfer plate being provided with

a plurality of louvers at certain intervals along the air passage to transfer heat of air passing through the air passage via the heat transfer plate,

wherein a windward side edge of the louver is formed so as to become thinner toward an upstream side of the air, and

wherein a cross-sectional contour configuration of the windward side edge of the louver is formed into a curved configuration.

19. The heat transfer fin as recited in claim 18, wherein the plurality of heat transfer fins are connected such that adjacent heat transfer fins are connected to form a corrugated fin.

20. (amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed between a pair of heat exchanging tubes arranged in parallel at a certain distance, the plurality of heat transfer plates being disposed in parallel with each other at certain intervals along a longitudinal direction of the heat exchanging tube to form an air passage between adjacent heat transfer plates, and the heat transfer plate being provided with a plurality of louvers at certain intervals along the air passage, whereby air passing through the air passage exchanges heat with refrigerant passing through the heat exchanging tubes,

wherein a windward side edge of the louver is formed so as to become thinner toward a windward side of the air, and

wherein a cross-sectional contour configuration of the windward side edge of the louver is formed into a curved configuration.

PCT/JP04/00625
10 AUG 2004

21. The heat transfer fin as recited in claim 20, wherein the plurality of heat transfer fins are connected such that adjacent heat transfer fins are connected to form a corrugated fin.

22. (deleted)

23. (amended) The heat transfer fin as recited in claim 20 or 21, wherein a cross-sectional contour configuration of the windward side edge of the louver is formed into a semielliptic configuration.

24. (amended) The heat transfer fin as recited in claim 20 or 21, wherein a cross-sectional contour configuration of the windward side edge of the louver is formed into a semicircular configuration.

25. (deleted)

26. (deleted)

27. (amended) The heat transfer fin as recited in any one of claims 20, 21, 23 or 24, wherein a leeward side edge of the louver is formed so as to become thinner toward a leeward side of the air.

28. (amended) A heat transfer fin, comprising:

a heat transfer plate disposed parallel or nearly parallel to a heat transfer medium passing direction, the heat transfer plate being provided with a plurality of louvers at certain intervals along

PCT/JP 04/00625

10 AUG 2004

the heat transfer medium passing direction to transfer heat of the heat transfer medium via the heat transfer plate,

wherein a heat transfer medium inlet side edge of the heat transfer plate and that of the louver are respectively formed so as to become thinner toward an upstream side of the heat transfer medium passing direction, and

wherein a cross-sectional contour configuration of the heat transfer medium inlet side edge of the heat transfer plate and that of the louver are respectively formed into a curved configuration.

29. The heat transfer fin as recited in claim 28, wherein at least one of heat transfer medium outlet side edges of the heat transfer plate and the louver is formed so as to become thinner toward a downstream side of the heat transfer medium passing direction.

30. (amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed in parallel with each other at certain intervals to form an air passage between adjacent heat transfer plates, the heat transfer plate being provided with a plurality of louvers at certain intervals along the air passage to transfer heat of air passing through the air passage via the heat transfer plate,

wherein a windward side edge of the heat transfer plate and that of the louver are respectively formed so as to become thinner toward an upstream side of the air, and

wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate and that of the louver

PCT/JP 04/00625
10 AUG 2004

are respectively formed into a curved configuration.

31. The heat transfer fin as recited in claim 30, wherein at least one of leeward side edges of the heat transfer plate and the louver is formed so as to become thinner toward a leeward side of the air.

32. (amended) A heat transfer fin, comprising:

a plurality of heat transfer plates disposed between a pair of heat exchanging tubes arranged in parallel at a certain distance, the plurality of heat exchanging plates being disposed in parallel with each other at certain intervals along a longitudinal direction of the heat exchanging tube to thereby form an air passage between adjacent heat transfer plates, the heat transfer plate being provided with a plurality of louvers at certain intervals along the air passage, whereby air passing through the air passage exchanges heat with refrigerant passing through the heat exchanging tubes,

wherein a windward side edge of the heat transfer plate and that of the louver are respectively formed so as to become thinner toward a windward side of the air, and

wherein a cross-sectional contour configuration of the windward side edge of the heat transfer plate and that of the louver are respectively formed into a curved configuration.

33. The heat transfer fin as recited in claim 32, wherein at least one of leeward side edges of the heat transfer plate and the louver is formed so as to become thinner toward a leeward side

of the air.

34. (amended) A heat transfer fin disposed in a heat exchanging tube through which refrigerant passes, the heat transfer fin comprising a heat transfer plate arranged parallel to a refrigerant passing direction to transfer heat of the refrigerant via the heat transfer plates,

wherein a refrigerant inlet side edge of the heat transfer plate is formed so as to become thinner toward an upstream side of the refrigerant passing direction, and

wherein a cross-sectional contour configuration of the refrigerant inlet side edge of the heat transfer plate is formed into a curved configuration.

35. The heat transfer fin as recited in claim 34, wherein a refrigerant outlet side edge of the heat transfer plate is formed so as to become thinner toward a downstream side of the refrigerant passing direction.

36. (amended) A heat transfer fin disposed in a heat exchanging tube through which refrigerant passes, the heat transfer fin comprising a plurality of heat transfer plates arranged parallel to a refrigerant passing direction, the heat transfer plates being provided with openings in a zigzag form to transfer heat of the refrigerant via the heat transfer plates,

wherein a side edge of the opening of the heat transfer plate facing an upstream side of the refrigerant passing direction is formed

so as to become thinner toward the upstream side of the refrigerant passing direction, and

wherein a cross-sectional contour configuration of the side edge of the opening of the heat transfer plate facing the upstream side of the refrigerant passing direction is formed into a curved configuration.

37. The heat transfer fin as recited in claim 36, wherein a side edge of the opening of the heat transfer plate facing a downstream side of the refrigerant passing direction is formed so as to become thinner toward the downstream side of the refrigerant passing direction.

38. (amended) A heat transfer fin disposed in a heat exchanging tube through which refrigerant passes, the heat transfer fin comprising a plurality of heat transfer plates arranged parallel to a refrigerant passing direction, the heat transfer plates being provided with openings in a zigzag form to transfer heat of the refrigerant via the heat transfer plates,

wherein a refrigerant inlet side edge of the heat transfer plate is formed so as to become thinner toward an upstream side of the refrigerant passing direction,

wherein a side edge of the opening of the heat transfer plate facing the upstream side of the refrigerant passing direction is formed so as to become thinner toward the upstream side of the refrigerant passing direction, and

wherein a cross-sectional contour configuration of the side

edge of the opening of the heat transfer plate facing the upstream side of the refrigerant passing direction is formed into a curved configuration.

39. The heat transfer fin as recited in claim 38, wherein a refrigerant outlet side edge of the heat transfer plate is formed so as to become thinner toward a downstream side of the refrigerant passing direction.

40. The heat transfer fin as recited in claim 38 or 39, wherein a side edge of the opening of the heat transfer plate facing a downstream side of the refrigerant passing direction is formed so as to become thinner toward the downstream side of the refrigerant passing direction.

41. (amended) A heat exchanger equipped with a heat transfer fin as recited in any one of claims 1 to 9, 11, 12, 15 to 21, 23, 24 or 27 to 40.

42. (amended) An evaporator for use in car air-conditioners, the evaporator being equipped with a heat transfer fin as recited in any one of claims 1 to 9, 11, 12, 15 to 21, 23, 24 or 27 to 40.

43. (amended) A condenser for use in car air-conditioners, the condenser being equipped with a heat transfer fin as recited in any one of claims 1 to 9, 11, 12, 15 to 21, 23, 24 or 27 to 40.